Aquatic Invasive Species Rapid Response Initiative

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Problem Statement

Invasive species have been identified as an ever increasing threat by several programs within the South Carolina Department of Natural Resources (SCDNR). Federal agencies such as the United States Fish and Wildlife Service (USF&W), the United States Department of Agriculture (USDA), United States Coast Guard (USCG), United States Geological Survey (USGS), United States Forest Service (USFS), National Oceanic and Atmospheric Administration (NOAA), and others have started to develop plans and protocols for dealing with these invasive species. Prevention is the first line of defense, however introductions still occur. A quick response is needed to deal with invasive species introductions before they can become established past the point of control or eradication. More often than not this requires a high level of communication to coordinate a timely and accurate response. Within the state of South Carolina there is no formal or consistent interagency mechanism in place for dealing with invasive species introductions. Each agency or program has their own niche or problem species and does not normally recognize them as problem species for other programs. .This narrow focus is often to blame for the lack of interagency communication. Early detection and a rapid response to these introductions can be crucial in the eradication and/or control of invasive species. We must be able to coordinate a response that is quick and complete when dealing with these invaders.

Data Collection

Goals for data collection were to understand the complexities of invasive species management when intertwined with the diversity of approaches that divisions within the SCDNR and other

agencies utilize in their daily decision making processes and to allow coordinated approaches to invasive species control. Literature review and trend data analysis of existing program data sets will be used as the primary methods of developing this approach. More extensively, trend data will be utilized from the USGS, Nonindigenous Aquatic Species (NAS) Database, Gainesville, Florida. The center, housed in the Florida Integrated Science Center, maintains an excellent database on introduced aquatic nonindigenous species by state. The database is updated on a regular basis. The most recent data on nonindigenous aquatic species for South Carolina and other states can be accessed at the USGS web site located at http://nas.er.usgs.gov. The NAS program was created by the Aquatic Nuisance Species Task Force (ANSTF) and charged with the following goal; to provide timely, reliable data about the presence and distribution of nonindigenous aquatic species. Ideally, this would be an interactive system. The NAS data is compiled from sources placed into a central repository for spatially referenced biogeographic accounts of nonindigenous aquatic species. Additional sources for data collection include colloquial data collected from two previous incidents where an informal rapid response protocol was utilized and an additional incident where there was no rapid response utilized.

Data Analysis

As shown by the data compiled, aquatic invasive species (AIS) can enter an ecosystem in a variety of ways and have extremely varied effects on the aquatic ecosystem. Initial impacts may appear beneficial until population levels reach the stage at which they can degrade habitat, kill and/or displace native and naturalized species, and short-circuit food webs needed to maintain and rehabilitate biological resources. Second only to habitat loss, invasive species are the major reason for extinction and endangerment of species worldwide (Sagoff, 2008). Almost half of the

species that are listed as threatened or endangered under the Endangered Species Act are considered to be at risk primarily because of competition with or predation by nonindigenous species (Wilcove et al., 1998). Ecological impacts of invasive species directly transfer to economic impacts. The impact of invasive species has been estimated to cost the United States up to $120 billion plus per year (Pimental et al. 2004). The Office of Technology Assessment of the U.S. Congress (1993) also estimated that there is direct spending on control of aquatic invasive plant species of $100 million per year of the estimated $97-$137 billion overall cumulative impact of invasive species in the U.S.(OTA, 1993).

In an ever widening global economy, species can travel faster and farther than ever before thanks to man's quest to be everywhere at once. South Carolina's temperate climate also allows the establishment of species from a variety of geographic ranges, as we can support the edge of tropical species invasions and also species that may need somewhat cooler environments to thrive. Introduced species have dramatically increased in South Carolina. A review of the data from NAS for aquatic species indicates that up until 1950 there were only 10 documented introduced species. In the most recent 50 year period that number has exponentially increased to over 135 (figure 1) introduced species documented.

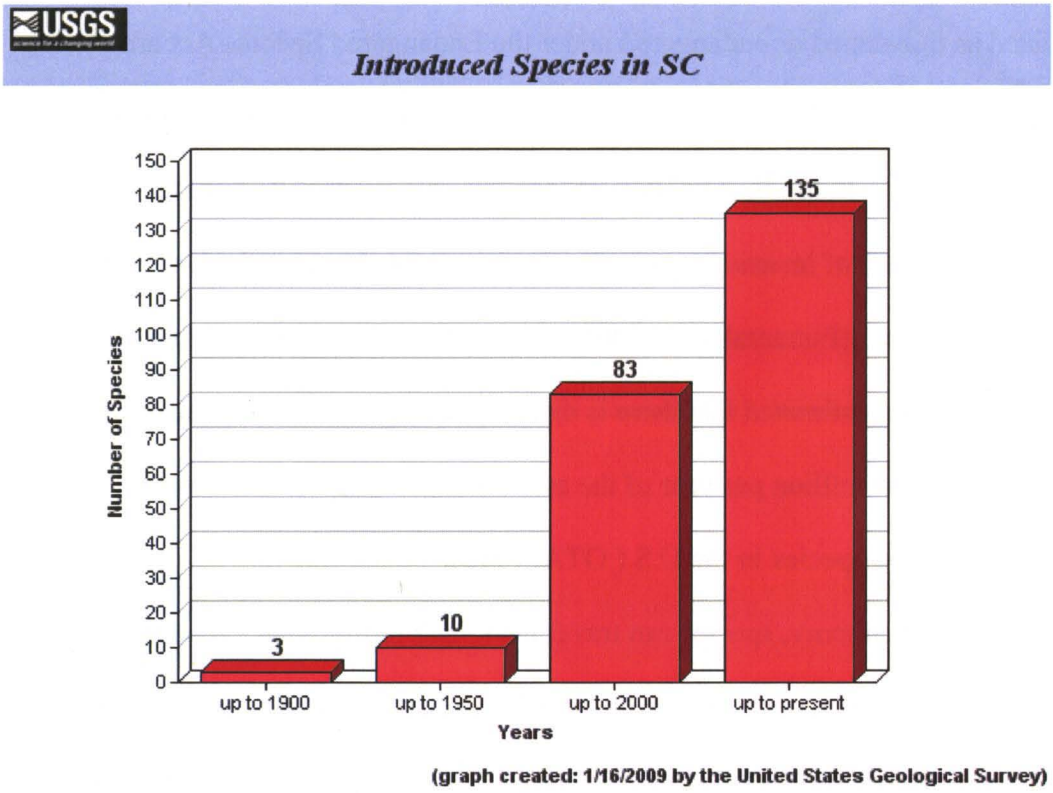

Figure 1. Introduced Species in South Carolina

About 89% of all non-native aquatic species introduced to the state were introduced after 1950 and a majority of them were exotics (figure 2). Native transplants also increased during that time as biologists rushed to provide desired fish species outside of their native water bodies, and as the public became more mobile with boats travelling greater distances for recreational opportunities.

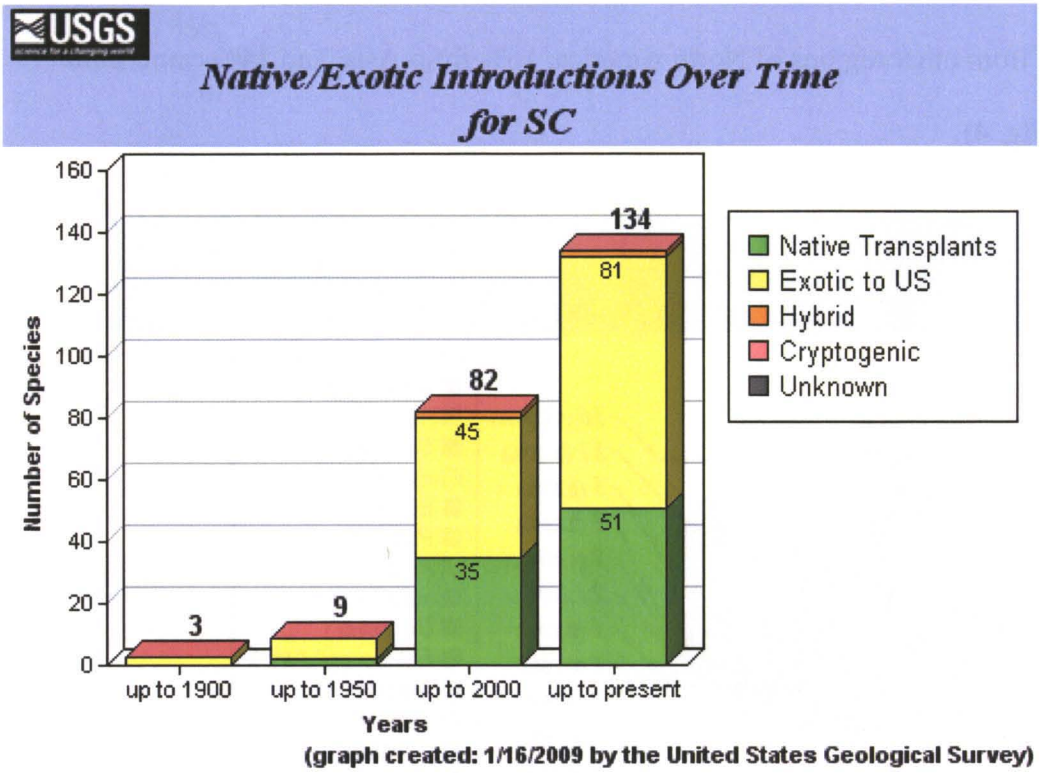

Figure 2. Breakout of Introduced Species in South Carolina

As Figure 3 indicates, most of these were fish (31%) followed by plants (28%).

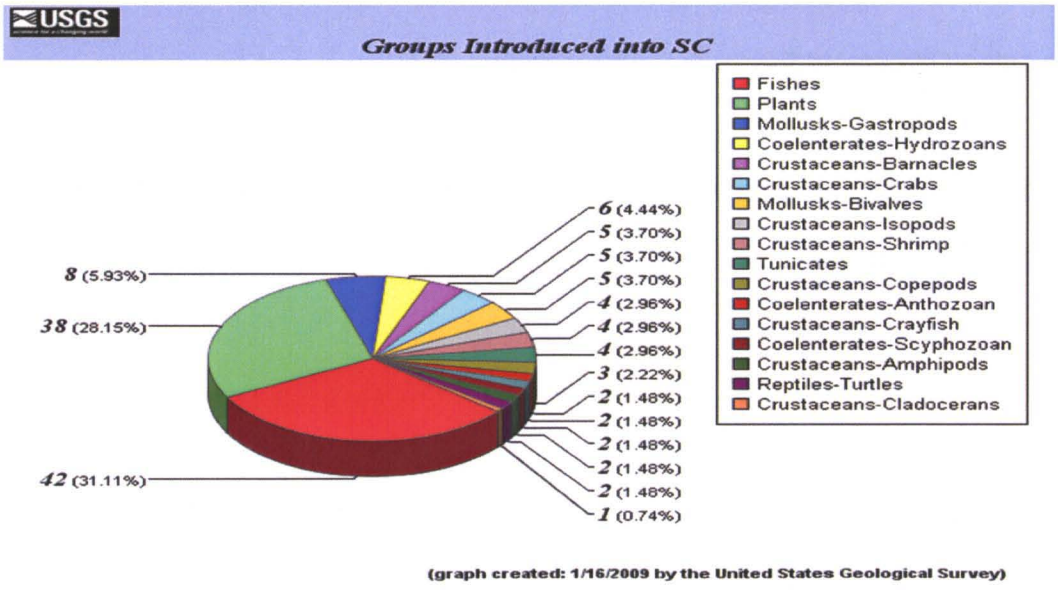

Figure 3. Groups of Introduced Species in South Carolina

About 36% came from other regions of North America, 16% from Asia, and 14% came from South America (Fig. 4).

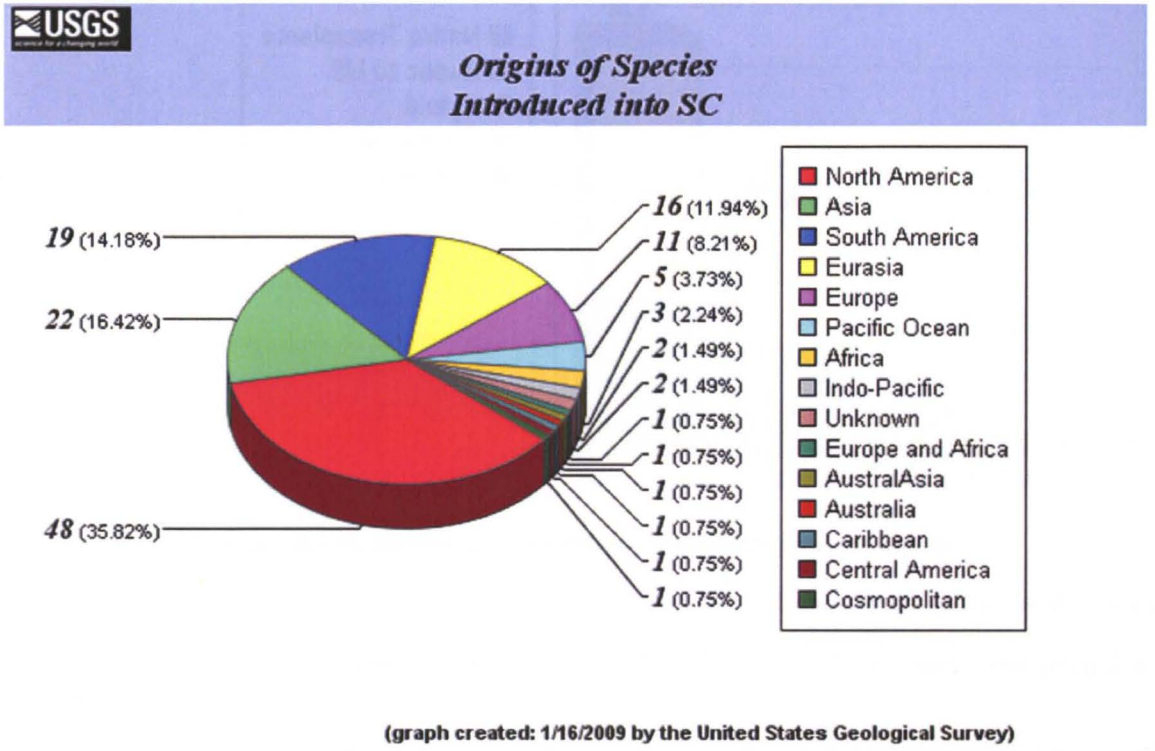

Figure 4. Origins of Introduced Species in South Carolina

By far most introduced aquatics are freshwater species (70%), followed by marine (26%) and brackish water (4%) species (Fig 5).

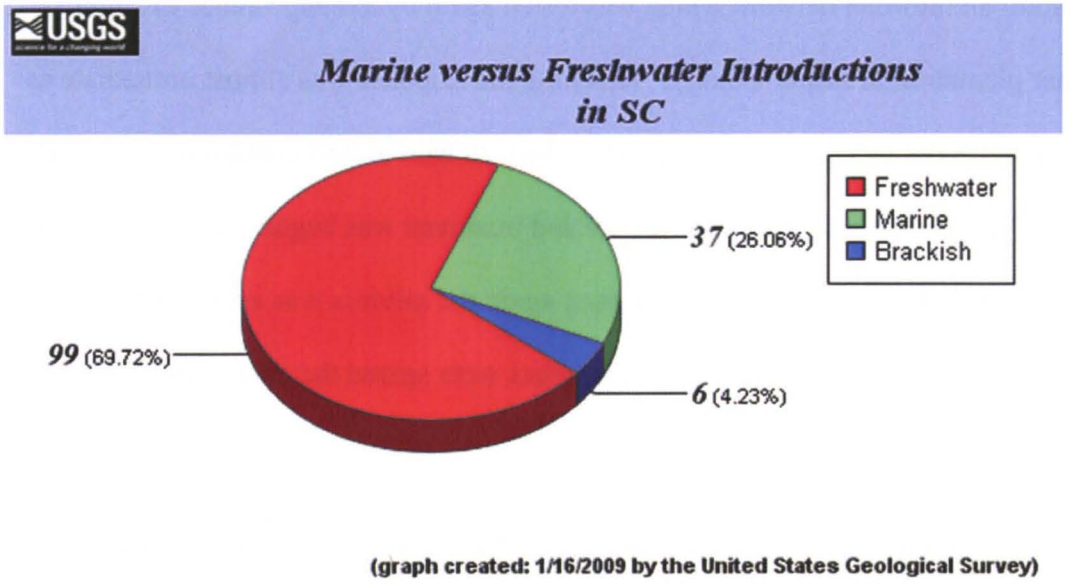

Figure 5. Marine vs. Freshwater Introduced Species in South Carolina

Colloquial data from recent events also come into play. In February of 1995 a plantation manager In Colleton County discovered he had a major problem on one of his ponds. The pond had previously been stocked with some ornamental fish and plants. Little did they know that a highly invasive species, *Salvinia molesta*, had hitchhiked in. The salvinia, which can double its biomass every seven days quickly took over the pond when temperatures were warm enough and by March, the manager had notified Clemson Extension Service and they had identified the problematic plant. Early treatments began in April of 1995 under recommendations of the extension service personnel yet there was no real control. In May, SCDNR officials were alerted and the beginning of a highly informal early detection and rapid response was started. After alerting the USDA APHIS and in conjunction with Clemson Extension a coordinated method of control was initiated and by August the salvinia was eradicated and did not have the opportunity to spread to SC's low country. This is the first site in the United States where *Salvinia molesta* was found and eventually eradicated thanks in part to a coordinated effort by several agencies.

These efforts lead to an informal network which was tested again by a reappearance of salvinia in 2004 at another plantation in Jasper County. This time the response was almost immediate as the first report was received by Clemson Extension on July 28 who in turn contacted the ANSP of SCDNR. A site survey was performed on July 29 and treatment was begun on July 30. This rapid response contributed greatly to the fact that once again the salvinia was eradicated form the site and surrounding pristine wetlands and coastal marshes were spared the onslaught of this highly invasive species.

In another incident, the highly invasive island applesnail, *Pomacea insularum*, was discovered in a pond Southeast of Socastee in Horry County. The first contact was with the SCDNR Fisheries division and occurred on May 5, 2008. By May 8, 2008 SCDNR ANS personnel were conducting an extensive survey of that site and surrounding areas. It was discovered in about 35 of the 200 ponds examined and a treatment protocol was initiated assuming that this was indeed an early detection and a rapid response. Initial treatments appeared to be highly successful but after a short period of time it was apparent that control would be more difficult. After several onsite surveys of the surrounding homeowners and contact with several other agencies it was determined that this species was not newly introduced and had been there for two to three years. Another agency had first been notified several years ago before and had miss-identified the AIS and allowed the establishment and spread of this species. Rapid response control efforts at this stage could not effectively eradicate the invasive snail.

From the three incidents mentioned above it can be noted that the proper identification and communication in these cases made the difference between eradication efforts and the establishment of AIS in South Carolina.

Implementation Plan

A variety of approaches has been developed by Federal, State, and Local governments, as well as non-governmental entities, to address AIS. Each of these entities has some jurisdictional control over programs which will be activated when new AIS problems are detected. When a new potential invader is detected, being able to efficiently coordinate and pool expertise and resources could mean the difference between fully eradicating a species, merely controlling it, or being overrun by yet another invasive species.

These strategies, which have been modified to fit AIS rapid response protocols in South Carolina, include the following recommendations:

Develop Interim Rapid Response Protocols:

This section addresses the question: What steps can be taken to prepare to implement a rapid response effort while a formal plan is going through the review and approval processes?

1) Memorandum of Understanding (MOU): The Directors of the appropriate agencies could sign an interim MOU directing their staff to participate in rapid response planning and implementation if a new AIS introduction occurs prior to the approval of the final plan.
2) Interim Funding: Staff from the cooperating agencies could identify and pursue interim funding sources for implementing a rapid response program.
3) Interim Strategy: Staff from the cooperating agencies could informally agree upon an interim strategy regarding roles and responsibilities should an AIS introduction occur.

4) Permitting: Management level staff from cooperating agencies could discuss how, in the absence of a formal streamlined permitting process, their staff could work within the existing regulatory permit programs to facilitate a rapid response operation and direct staff to follow through on these interim measures.
5) Employee Assignment: Management level staff of cooperating agencies could assign employees to an interim core rapid response team or working group. This team could participate in some advance preparation and planning. In the event of a rapid response, this team would need to be augmented by additional staff based on the location of the response and the necessary areas of expertise.

Develop Formal Rapid Response Plan:

Early Detection:

It is important that detection networks are highly active and trained to focus on high priority target species. These species lists should be developed by research methods which ultimately stem from proactive risk assessments for each individual species in a region.

An integral part to the early detection phase would be the inclusion of a communication protocol which is designed to alert all necessary entities to the problem species. The key to effective communication is to implement a chain of command approach utilized for most major emergencies. The standard definitions include an Incident Commander which will take charge of the site and provide a consistent unified approach to the planning and implementation of the containment, control, or eradication activity. Specific steps to develop this part of the plan include:

1) Establishment of a SCDNR intra-agency Rapid Response Team that will conduct activities on state waters, and in other locations with Federal and Local cooperation.
2) Establishment of Formal Agency Points of Contact with outside agencies for interagency cooperation and to provide a network of concerned users.

It should be noted that no two agencies have the same organizational structure. In order to streamline communication between different agencies, a pre-requisite for this protocol is for each participating agency to identify formal points of contact. This will allow agencies to be responsive to their own internal organizational structure, yet still be able to communicate with others in a methodical way.

All specimens should be vouchered and have the basic information provided on the Rapid Response - Suspected AIS Sighting Report (Form 1) which is included in Appendix 1. Following the detection of a possible new invader, the identity of the organism is confirmed by taxonomic experts. Identifying the appropriate taxonomic experts is the challenge in this phase. The following steps will ensure the quick taxonomic confirmation of the suspected organism:

1) An Agency/organization is made aware of a suspected organism through monitoring or referral.
2) The Agency contacts taxonomic experts using existing contacts and/or by referencing the National ANSTF Expert Database and the information on the follow-up is recorded on the Rapid Response - AIS Report (Form 2) which is included in Appendix 1
3) Species is either confirmed or disproved as existing or new AIS.

Rapid Assessment:

Academic institutions, government agencies and other organizations that agree to cooperate on rapid response should work together through various AIS working groups, professional and environmental organizations and commercial interests to promote research that can specifically improve or promote rapid response efforts by creating and sharing risk assessments for high priority species well ahead of time. These risk assessments will take into consideration all of the components which possibly could delay implementation of an effective response so that there are no delays in control or eradication activities. Creation of new risk assessments for newly discovered species should be done in a timely manner so as not to delay the control operations for an unreasonable amount of time. Existing sources of data or current surveys can serve as the backbone for the creation of new assessments. It is also important to use consistent data so that information can be utilized in repeatable, scientific processes to support these risk assessments.

Rapid Response:

The governmental authority with jurisdiction over the area of invasion is made aware of the presence of new AIS. This Jurisdictional Authority for that area is responsible for leading the remaining stages of the response effort.

1) Detecting agency notifies Jurisdictional Authority of new AIS.
2) Jurisdictional Authority issues a directive to alert AIS coordinators at other agencies of the presence of new AIS. *Note*: "Invasive Species Response Coordinators" may proactively begin to identify possible experts and available resources within their agency at this time.
3) Jurisdictional Authority issues a public statement of the presence of the new AIS.

From this point onward, response planning will likely be species or site-specific and the complexity of the next steps is beyond describing in a general communication protocol. However, all the appropriate contacts will have been made during the early phases of the rapid response effort.

Additionally, SCDNR and other appropriate agencies should form an "official" AIS Task Force, with SCDNR as chair, which would further increase the coordination of AIS activities throughout the state and would serve as an advisory board by providing structure and oversight to the statewide rapid response plan. Part of the oversight responsibilities would include review of the protocol and past management actions. Review should include such key items as input, output and outcome measures. Not only should we analyze total species controlled but how efficient and effective the process was. This review should occur at least every 2 years to insure that the rapid response protocol continues to evolve and that new information and techniques can be incorporated to improve both policy and the physical on-site management of invasive species. Data collected from incidents would be utilized in these performance reviews and evaluations. Can we meet the standards imposed on us is the main question. If not, what changes need to be made?

Summary and Recommendations

Once established, AIS can have irreversible effects. Because of this, preventative education and an early detection and a rapid response system of dealing quickly and decisively with these invasions is not only encouraged but is a necessity in the battle to prevent AIS from ultimately changing our aquatic ecology.

Furthermore, the development of a rapid response protocol is the primary building block on which prevention of AIS is built. For every single acre prevented or treated in a timely manner you can eliminate control costs for potentially hundreds of acres over years. This thought is enforced by the statement "an ounce of prevention is worth a pound of cure". Behind the initial discovery of the species, communication may be the single most important block for effective rapid response. If someone recognizes and identifies a species as invasive and does not notify the proper authorities then the chain of communication is broken and response may be delayed to the point that there can be no effective early control measures to stop the invasion. South Carolina continues to face wave after wave of aquatic invasion.

Appendix - Supporting Materials

Rapid Response - Suspected AIS Sighting Report (Form 1)

Please fill in as many of the information fields as possible.

Report Tracking #_____(assigned by RR team member)

Date of Sighting: _____

Reporter's First and Last Name: _____

Reporter's Phone Numbers: Home: _____ Work: _____Cell: _____

Reporter's E-Mail Address: _____

Reporter's Mailing Address: _____

Type of Organism (be as specific as possible (e.g. submerged plant, shellfish, etc.):_____

_____

Description (size, color, shape and/or other distinguishing characteristics): _____

_____

Approximate number or area they occupy: _____

_____

Location of sighting (water body and/or Latitude Longitude): _____

_____

Directions and/or description of nearby landmarks: _____

_____

Attach any photographs taken or specimens collected: _____

Contact information for Landowner or Land Manager: _____

_____

Possible Source of Introduction: _____

Name and Contact Information of Person Filling Out This Form: _____

_____

Rapid Response - AIS Report (Form 2)

To be filled out following a survey of a possible AIS sighting

Report Tracking #_____(assigned by RR team member)

Species Name: _____

Date of Initial Sighting: _____Date of Survey: _____

Responder First and Last Name: _____

Agency: _____

Responder Phone Numbers: Work: _____ Cell: _____

Responder E-Mail Address: _____

If the identification was verified by expert, who provided the verification?

Verifier's phone number(s): _____ E-mail:_____

Specimens Collected? _____

Sighting Location (if possible attach a map showing the location):_____

_____

County: _____Body of water: _____

Landowner/Manager: _____

Describe location_____

Jurisdictional Authority:_____

Source of Coordinates (GPS, topo map & type):_____

GPS Make and Model: _____ Datum: NAD27____ NAD83____ WGS84____

Geographic Latitude/Longitude: _____

Describe species population: _____

Describe any evidence of reproduction (flowering, juvenile animals, egg masses, etc.)_____

_____

Describe habitat: _____

(e.g. plant community, associated plant species, host species, water depth, distance from bank, substrate characteristics (e.g. gravel, large rocks, silt, sand), etc.)

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